But the most valuable of Professor Marsh's papers is the last, which appears in the "Journal of Science" for June. It is a review of the "Structure of the Skull and Limbs in Mosasauroid reptiles," made possible only by the richness of the Yale Museum in the remains of these remarkable animals. Though this paper is almost entirely a technical one, yet the results are obviously of high scientific interest. Prof. Marsh shows that the quadrate bone of the skull as given by Professor Cope should be reversed, by finding a skull of *Lestosaurus* with this bone in position. Moreover, his explorations have discovered the stapes, the columella, the quadratoparietal arch, the malar arch and the pterotic bone, belonging to the cranium; and have proved the exact character of the anterior limbs and the presence of posterior limbs in these reptiles. They also show that the neck in the Mosasaurus group was unusually short. Two new genera, *Lestosaurus* and *Rhinosaurus*, are described; under the former, four new species are included. *Rhinosaurus micromus* Marsh and *Edestosaurus rex* Marsh, are also here described. The paper is illustrated by four admirable lithographic plates.

MICROSCOPY.

Cells for Mounting Objects.— A recent discussion on this subject at the Queckett Microscopical Club in London, developed several important suggestions.

Lead cells. Mr. James Smith introduced the subject by a paper "On Cell Mounting." He used cells of sheet lead; flattening the sheet on a plate of glass by rubbing with an ivory paper knife, and cutting or punching cells which were subsequently flattened by pressure between two ordinary glass slides. Dr. Matthews suggested flattening the lead upon a plate of glass, by rolling, and cross rolling, with a piece of barometer tube. The Chairman, Henry Lee, Esq., remarked that Dr. Bowerbank had for years used exclusively tea lead for his smaller cells and common plumbers' lead for his larger cells: all his large collection of sponges were successfully mounted in this way. The secretary, Mr. T. C. White, had been in the habit for many years of using cells of thin sheets known as "pattern lead" used by dentists; the cells being easily stuck on with marine glue, and not melting if the slide should be made nearly red-hot.

Tin cells. Mr. Richards had used cells of rather thin tin foil, cut out with two punches with a piece of tube between to keep them the right distance apart: these cells were fastened on by a solution of glue and treacle dried on and then moistened enough to stick them, the cells being so thin that any liquid cement would have run in. The chairman commended the tin cells introduced by Mr. Suffolk; he having used them, fastening them on with marine glue with great satisfaction: Dr. Matthews, however, objected to them because they melt so easily if the slide be overheated.

Zinc cells and *vulcanite cells* were favorably mentioned by Mr. White, the former bearing great heat without melting, and the latter resisting the action of acids: but Mr. McIntire found they had a tendency to chip off.

[The expensiveness of glass cells, when used in large quantities, is the continual occasion of a demand for some good substitute. Tin cells are largely used in this country, being often fastened on by gold size whose only fault is that it dries so slowly that the cells require to be fastened on long before using, or with dammar varnish or Bell's cement. Doubtless the lead cells will hereafter be used by many who desire to preserve a great many specimens but cannot afford to spend unnecessarily on an elegant mounting. It would seem that some of the dealers might prepare and sell them at a price that would be remunerative to themselves, and at the same time an accommodation to buyers.]

The Common Paraboloid as an Immersion Instrument.—Notwithstanding the introduction into use of special contrivances as immersion paraboloids, it may not have occurred to all who use the microscope that the ordinary form of parabolic illuminator is capable of being used wet with excellent results. Placing the microscope in a vertical position, and greasing the rod in the centre of the paraboloid to keep the water from running out by the side of it, the cup of the paraboloid is filled with water heaped up as far as can be without running over, and then brought up until the water comes in contact with the under surface of the slide. The direction of the rays leaving the paraboloid is not altered by this arrangement, but dispersion at two surfaces is avoided and the rays enter the object slide without the usual refraction and at such an angle as to suffer total internal reflection before reaching

the objective. With the highest objectives generally used with black ground illumination, as a $\frac{1}{4}$th of 75° to 110°, the object seems no brighter than usual, but the field is free from the foggy diffuse light, otherwise present, and the object appears, beautifully distinct, upon a jet black ground. Even a $\frac{1}{5}$th or $\frac{1}{8}$th of 130° gives the same effect of a deep black background, and shows the object with good stereoscopic effect in Wenham's binocular. With objectives of 170°, the main effect is that of a dark background, though not so perfect as with the lower angles.—T. D. B.

Bichromatic Vision.—Mr. J. W. Stephenson, inventor of the recent binocular microscope which bears his name, has noticed that if different colors are presented, simultaneously, to the two eyes, the sensation produced will be that of neither of the two colors, but of one which would be produced by mixing them together. If the colors presented are strictly complementary, the effect will be that of common white light; as the two bright colored disks produced in the field of a microscope by a double image prism and a selenite plate, become white where they overlap. The effect is best studied with the binocular microscope and polariscope. A plate of selenite is introduced so as to give both fields of a bright conspicuous color; and then a film of mica is interposed in the course of the rays supplying one tube, of such thickness and position as to give, by retardation, a color as nearly as possible complementary to the first. One field, for instance, may be a bright red, and the other a bright green, while the observer, viewing both at once, will see only a colorless field. By an ingenious changing of the plates by which the colors are produced, both fields may be gradually changed to totally different colors, the complementary character being maintained throughout the change, without any knowledge of the change on the part of the observer. If the color of one field is entirely removed, the observer becomes slowly and feebly conscious of the color of the other. The optical and physiological bearings of this discovery are obvious and interesting.

New Arrangement of Spring Clips.—Miller Bros., of 1223 Broadway, N. Y., are manufacturing a contrivance which must be, for certain purposes, a very convenient substitute for Dr. Maddox's spring clips. It consists essentially of a mahogany strip, of suitable size, grooved upon its upper surface and protected with

pins in such manner that a dozen slides can lie, side by side, securely upon it. An equal number of thin brass wires spring from one side of the block, and are bent down so that they can be easily made to press upon the centres of the covers, to hold them in position while the balsam or other mounting material is hardening. Little cork disks are furnished to place upon the covers and beneath the springs. For some uses the corks would doubtless be dispensed with, and when needed they would probably be more convenient if attached to the wires by passing the wires through them. An additional groove should be cut in the wood under one end of the glass slides to facilitate the removal of one slide without disturbing the others.

Single Front Objectives.—Mr. Wenham believes that the principal use of the late discussion upon the working angular aperture of immersion objectives viewing balsam-mounted objects, which angle he still maintains is necessarily limited to 82°, although Mr. Tolles cannot see the difficulty of its exceeding that figure, consists in the dissemination of the information that the best American objectives, both dry and immersion, are now made with single fronts. As the originator of this style of construction, though having at the time no knowledge of its importance nor expectation of the success it has since attained, he naturally feels an undisguised interest in its success. The triple-front objectives he considers already obsolete.

Microscopy at the American Medical Association.—During the Philadelphia meeting of this society, this summer, an evening reception was given at the Academy of Natural Sciences, at which music and sociability were supplemented by the entertainment afforded by microscopic specimens. One hundred microscopes were used, and novel accessories exhibited.

Structure of Diatoms.—Prof. Adolf Weiss, of Lemberg, has published some researches upon this well-studied but still obscure subject. He regards the silicious envelope as capable of polarizing light, and as consisting of a cellulose coat more or less infiltrated with silex. He does not consider the individuals one-celled, but finds the valves composed of cells from .008 to .00025 mm. in diameter. These cells are furnished at their centres with papillæ which appear as striæ under low powers and as moniliform mark-

ings under high powers. The large cavity between the frustules is regarded as equivalent to the embryo-sac of higher plants, and the formation of new individuals has been observed within it. An alternation of generation is indicated by the observations made.

ORIGIN OF CANCEROUS DEPOSITS.—Dr. J. J. Woodward discusses this question in a report to the Surgeon General. His observations of structure do not differ materially from those of other recent observers, though the cell walls of the cancer cylinders, described by Kœster, he is able to detect in only a portion of the cases. He reviews the theory of Kœster who regards the nucleated cylinders as transformed lymphatics, and of Thiersch who explains them as outgrowths from the lower layer of the epidermis and from the epithelium of the glandular apparatus. The latter view was originally applied to epithelial cancer, but has been extended by Billroth to cancer generally. Dr. Woodward is manifestly unwilling to commit himself to any theory, but rather favors Kœster's on account of the well known similarity of the morbid growths when affecting different organs, and on account of the manner in which the cell cylinders anastomose, which points rather to the lymphatics than to the gland tissue. He seems not unwilling to regard the cancer cylinders as consisting of transformed white corpuscles accumulated in the lymphatic passages. The presence or absence of a cell wall he justly considers unimportant, it being only an indication of age in cells which, according to our present knowledge, consist originally of only a nucleus embedded in a mass of protoplasm.

THE "NERVE" OF THE TOOTH.—Mr. T. C. White has read a very interesting paper on this subject before the Queckett Microscopical Club. Though considering it a painful subject, and not to be touched upon except very lightly, he nevertheless considers it interesting to know something of its structure and uses.

The pulp, or so called nerve of a tooth, should be obtained from a tooth of the temporary set removed in a state of health to make room for the advancing permanent set. A longitudinal groove is to be filed around the tooth, which is then to be very carefully washed, and then split with a pair of wire nippers. The pulp will thus be fully exposed, and may be stained by soaking for twenty-four hours in an ammoniacal carmine solution as recom-

mended by Mr. Beale, washed, soaked in glycerine for a few hours, and finally flattened by gentle pressure in a compressorium for a few hours more until it is sufficiently thin to be examined by a $\frac{1}{4}$th inch objective. It is also advised to soak an entire tooth for a few weeks in the carmine staining fluid, then decalcify it by immersion in hydrochloric acid, and cut thin slices through the whole which will show the pulp and decalcified osseous tissue in their natural relation to each other.

Thus studied, the "nerve" appears to be a mass of areolar or connective tissue, through which ramify the nerve, vein, and artery. It not only constitutes a very delicate sensory organ, but originally was the means of building up the dentine; and even in adult life performs an important part in sustaining the vitality of the tooth, and is capable under certain stimulating influences of developing dentine again. [The unsatisfactory nature of a tooth whose "nerve" has been "killed" would seem to be confirmed and explained by these views of its functions.]

MISNAMING OBJECTIVES.—[Although the controversial part of this question has occupied too much time already, we publish the following note from Mr. Stodder who seems entitled to an opportunity to correct the idea that his having previously written over initials implied an unwillingness to assume full responsibility for his statement. The editors of this Journal are not responsible for anything credited either by name or initials to any other authority.—EDS.] The brief remarks of mine, printed over the initials C. S. in the March number of this Journal, were copied essentially in the "Monthly Microscopical Journal" for April. In the May number of that periodical Mr. Wenham writes a reply. It is a remarkable paper not only from the eminence of the writer, as an authority on microscopy, but from his evident loss of temper and by the terms to which he refers to Mr. Bicknell and to C. S. Under these circumstances I must ask for a little space for a rejoinder to my share; I have nothing to say for Mr. Bicknell as he is able to take care of himself.

Mr. Wenham commences his paper which *he calls* a "reply" with this,—"to correct a misstatement that I [Mr. W.] wrote a paper in reply to one of Mr. Bicknell's; I did not commit myself to such an extent." This is a mere quibble, unworthy of its author. The very caption of the paper had Mr. Bicknell's name

in it. I should not have noticed this, had not Mr. W. unfairly, as I think, charged me with a misstatement.

Next, Mr. Wenham couples C. S. and Mr. Bicknell together as if they acted in concert, and were joint writers. I can assure Mr. Wenham that it is not so. Mr. B. is not responsible for any thing I have written, nor am I for him. Neither had seen the other's writing until it was public.

Next, I have no "plea or atonement" to make "for expressions hastily or inconsiderately written." My expressions were used deliberately and after full consideration of their import. I still hold the same opinion, namely, that selling an objective by a name that does not *approximately* indicate its focus (*i. e.* $\frac{1}{5}$ for $\frac{1}{4}$, $\frac{1}{20}$ for $\frac{1}{16}$ or, as I have known, $\frac{1}{20}$ for $\frac{1}{40}$, as in the case of an eminent French maker; or, as in another instance, a $\frac{1}{18}$ for a $\frac{1}{30}$; or, as in the case of an English objective that I have recently heard of, a $\frac{1}{20}$ for a $\frac{1}{8}$) is an "imposition," or a fraud if that term is preferred, not applying it, however, as Mr. Wenham represents, to a particular firm, but to all, of any country, who practise such "imposition;" and that Mr. Wenham in his paper, by stating that "$\frac{1}{8}$ths were $\frac{1}{3}$ths or $\frac{1}{10}$ths, and some now approach $\frac{1}{12}$ths in power," without disapproval, was practically defending the custom, and *that* he does not now deny. His paper in reply to Mr. Bicknell was published in December. In May he writes, "no one knows better than myself the difficulty of adopting a nomenclature that shall exactly denote the power of all the highest object glasses sent out"—something has evidently produced some effect on him since that time. The complaint was not of want of "exactness," but of gross misnamers of twenty or fifty per cent., such as he named in the December paper, not in regard to the highest powers alone but applicable to the lowest powers as well. Such was what I called an imposition, and I call it so now.

In the "Quarterly Journal of Microscopical Science," October 1862, Capt. Mitchell gives the measurement of the focus of several London objectives; most of them being undernamed. Capt. M. complains of this; he says "when I buy a $\frac{1}{4}$th, I want a $\frac{1}{4}$th, not something else." He calls those correctly named, *honest;* by implication, those not so named, dishonest.

Dr. Wm. B. Carpenter ("The Microscope," fourth ed., 1868, p. 184) says, "the designations given by the opticians to their objectives are often far from representing their focal length, as estimated by that of single lenses of equivalent magnifying power, a

temptation to *underrate* them being afforded by the consideration that if an objective of a certain focus will show a test object as well as another of higher focus, the former is to be preferred. Thus it happens that what are sold as $\frac{1}{2}$ inch objectives are often more nearly $\frac{4}{10}$, and that what are sold as $\frac{1}{4}$ are not unfrequently more nearly $\frac{1}{5}$." I presume that I am justified in assuming that Mr. Wenham was fully aware of both the above, that Capt. Mitchell termed the custom dishonest in 1862, and Dr. Carpenter that it was the result of "temptation" in 1868, yet he did not feel called on to "practically defend" the want of honesty, or the yielding to temptation. Was he not then as now "a witness in behalf" of those *he* calls the "most respectable portion of the body?" Was it only censure from this side of the Atlantic that was "worth caring for?" It certainly looks so.

For some twenty years I have watched Mr. Wenham's contributions to microscopy. I have used and admired his ingenious inventions and appliances and have looked upon him as one of the foremost leaders and authorities in the mechanical and theoretic departments of the science. It was with regret that I saw that he did not disapprove of the fictitious nomenclature. It is with greater regret that I find that he has in his haste used the arrogant expressions that he has.

The question of nomenclature is now being agitated, the attention of microscopists is attracted to it, and one consequence will be that the "honest" makers will be appreciated.— CHARLES STODDER, *Boston*, *May 27th.*

NOMENCLATURE OF OBJECTIVES. — Dr. J. J. Woodward's paper on this subject in the June number of the "American Journal of Science and Arts," goes over a considerable part of the same ground as Dr. Ward's paper published in the NATURALIST three months before; though that paper had not been read by Dr. Woodward at the time of writing the principal part of his article. Both authors are laboring for the same result, uniformity, though with some important minor differences of which we shall speak at another time. Both have proposed the naming of objectives by their amplifying powers; but it is greatly to be desired that no one shall adopt such a plan until some distance of measurement can be agreed upon by all. We have enough individual differences to reconcile already.